

ical charts, but which is all important in the mechanics of the earth's atmosphere when we come to consider its general circulation and the phenomena that depend on the diurnal rotation of the earth. The ordinary geographical maps of the Northern and Southern hemispheres are drawn as tho the observer stood over the North Pole and the South Pole, respectively, and lookt down upon the corresponding hemisphere; consequently a map of the Northern Hemisphere ordinarily represents longitude counted westward from Greenwich around the North Pole of the map as increasing in the anticyclonic or right-handed direction, while a map of the Southern Hemisphere represents the same longitudes, counted westward from Greenwich around the South Pole as increasing in the cyclonic or left-handed direction, as shown in the accompanying diagram, fig 2, Plate IV.

This method of treatment may do for descriptive geography and history and for navigators and geographers who consider only relative locations, but it is not appropriate for geophysical studies such as earthquakes. The immense inertia of the whole mass of atmosphere (revolving in one direction around the earth's axis, which we ought to call the left-handed, or positive, direction just as we do the similar direction of its annual revolution around the sun) is the most important item in meteorology, therefore we must recognize the necessity for a more rational treatment of the maps that are made for meteorological study. This is easily accomplished by drawing the polar map for the Northern Hemisphere on the plane *nn*, Plate II, as usual, viz, as seen by an observer looking down upon the earth from some point above the North Pole; then consider the earth as being transparent so that the observer, while retaining his position at or above the North Pole, looks thru the globe, as in fig. 3, Plate IV, and sees the Southern Hemisphere projected on the plane *ss* just as he had seen the Northern Hemisphere on *nn*. The two resulting maps, therefore, appear as in fig. 4, Plate IV; in both of them the longitudes circulate around the globe in the same direction as shown by arrows, *L* and *L*, while the diurnal rotation of the earth around its axis proceeds in the opposite direction as shown by the arrows *R* and *R*; the annual revolution about the sun also proceeds in this same opposite direction as shown by the arrows *A* and *A*.

By this arrangement of the maps of the Northern and Southern hemispheres, one can place the northern map above the southern with its center *n* superposed on *s*, and with a common axis of rotation so that the passage from the Northern to the Southern Hemisphere, at any point of the equator becomes continuous. In polar maps made on this system the cyclonic rotation within an area of low pressure, *x*, in the Northern Hemisphere is a positive or left-handed rotation on the map, and the so-called anticyclonic rotation around a similar area of low pressure, *y*, in the Southern Hemisphere becomes converted into a positive, a left-handed or cyclonic rotation, on the map. Thus the rules that have been formulated for ordinary usage on maps as ordinarily constructed, lose their antitheses, and the rotation about low areas is cyclonic or left-handed in both hemispheres, while the rotation about high areas is anticyclonic in both hemispheres. Any movement of the atmosphere will have a corresponding deflection toward the right on the maps of both the hemispheres alike.

If two raised maps be made according to this method, imitating the elevations and depressions of the earth's surface, one for the Northern and one for the Southern Hemisphere, respectively, and if one be placed above the other on a rotating shaft, as in fig. 5, Plate IV, and a little water be poured into the depressions on each chart, and the shaft be set in rotation, we have an approximate presentation of the action of the ocean on the globe. Experiments may thus be made with gases and liquids that shall approximately reproduce the motions of the atmosphere. By such laboratory ex-

periments we may elucidate some of the difficulties attending the study of the general circulation of the atmosphere, since the formulas for passing from small models to the larger conditions of nature have already been given by W. von Helmholtz in his memoir on dynamic similarity.

21. *Projections and models on concave surfaces.*—The flat maps and models hitherto considered can serve only for a study of the motions of the lowest stratum of atmosphere, tending in general toward the equator. They must be supplemented by something better if we are to study by means of models the simultaneous motions of the upper strata which are moving in general poleward from the equator.

In the lowest stratum the general increase of temperature and humidity and the consequent diminution of density with diminution of latitude combine with the gravitational and centrifugal force to push the air toward the equator; when all this takes place on the ideal smooth sea-level surface or level surface of apparent gravity then gravity does not affect the motions except thru differences of density in masses of air of appreciable depth.

But in the upper strata the equatorial air either overflows poleward in a system of vertical circulations or overflows eastward and revolves horizontally while moving poleward in systems of circulation that soon make themselves felt at the earth's surface as areas of low pressure. In these upper strata a component of gravity is the force that overcomes the centrifugal force and other obstacles and produces the poleward flow down grade from which result the barometric gradients of our "lows" and "highs."

Hence we must devise a rotating model in which local gravitation at the laboratory shall give rise to descending poleward currents that shall simulate the overflow on the rotating globe. One way to accomplish this in a working model is to replace the flat maps by projections and models on concave curved surfaces, thus making shallow saucer-like models as in fig. 6, Plate IV. But the details of this construction belong to dynamics rather than to cartography.

#### THE JAMAICA HURRICANE OF OCTOBER 18-19, 1815.

By MAXWELL HALL, Esq., Government Meteorologist. Dated Chapeltown, Jamaica, December 10, 1907.

This extraordinary storm, which lasted at Port Antonio for forty-eight hours, had some features resembling the hurricane of 1880. There were two centers, one of which moved slowly as it developed energy, while the other, fully developed, moved faster along its course toward the west-northwest, the usual direction. The motion of the former was abnormal; it was first toward the southwest, but when the center met the Blue Mountain Range south of Port Antonio, it stopt and even recoiled, and then advanced slowly again toward the southwest and Kingston.

Dr. W. Arnold has given a detailed account of the storm, as experienced at Port Antonio, in Vol. II of the Jamaica Physical Journal; he took great pains with the varying directions of the wind, and tabulated them at the end of his account so that there should be no mistake, and by means of a brief account of what occurred in Kingston, as given in the Royal Gazette, it is possible to make a short study of this storm. The small provisional maps attached to this article will be found useful.

*Extract from the Royal Gazette.<sup>1</sup>*

KINGSTON, Oct. 21st.

#### SEVERE STORM.

On Tuesday, Oct. 17th, during the afternoon a heavy fall of rain set in, with a fair prospect of good October seasons; but about two o'clock on Wednesday morning it began to blow extremely hard from the eastward, from whence it changed to the SE; and on the following day it shifted to different quarter of the compass, from N to NW and W, and thence to N,

<sup>1</sup> From Saturday October 14, to Saturday October 21, 1815.